Specifically, the Examiner has rejected claims 1-3 under 35 U.S.C. § 103(a) as being unpatentable over JP 2002-025404 of Katsuhiko et al. ("JP '404"). The Examiner argues that JP '404 discloses a fuse element containing a wire element (fuse) which has an alloy composition in which 0.1 or more weight % of silver are added to an alloy of indium and tin, and a heating element for fusing off the fuse element. JP '404 allegedly discloses all of the claimed limitations except that the alloy contains 0.1 to 7 weight parts metal and 100 weight parts of an alloy of 52% to 85% In and Sn. However, the Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to include weight parts of In and Sn of 52 to 85% since this would only be discovering an optimum or workable range. Applicants respectfully traverse this rejection and the arguments in support thereof as follows, and respectfully request reconsideration and withdrawal of the rejection.

The present invention is directed to an alloy type thermal fuse and fuse element containing an In-Sn alloy which exhibits operation stability to heat cycles, an operating temperature of 120 to 150°C, and a high yield of the drawing process of the fuse element. Applicants have discovered that an alloy type thermal fuse which exhibits these properties may be attained by utilizing a wire for the thermal fuse element which contains: (1) an alloy composition of 100 weight parts of an alloy of 52 to 85% In and balance Sn; and (2) 0.1 to 7 weight parts of Ag, Au, Cu, Ni, Pd, Pt, and/or Sb added to the alloy in (1).

By including feature (1) (the base alloy composition of In and Sn) in the wire, the operating temperature of the resulting thermal fuse element can be set to a predetermined temperature in the relatively wide range of 120 to 150°C. Specifically, as described at page 8, line 22 to page 9, line 2 of the present specification, since the liquidus temperature is 115 to 145°C and the solid-liquid coexisting temperature is about 6°C or narrower, the operating

temperature of the thermal fuse can be set to 120 to 150°C, and the dispersion of the operating temperature can be kept small (4 to 5°C or less), which are desirable physical properties.

Further, by including a small amount of Ag, Au, Cu, Ni, Pd, Pt, and/or Sb (feature (2)), an intermetallic compound of at least of one these metals and In or Sn having high ductility is produced. Such a compound limits slippage between crystals due to the wedge effect, ensuring thermal resistance stability to a heat cycle and providing sufficient strength against a drawing process, such that drawing to a thin wire of 300 μm diameter can be performed. It is thus possible to prevent a significant variation of the resistance of the fuse element and inferior operation thereof from occurring. The claimed amounts of metal included in the wire are critical. As explained at page 9, lines 13-20 of the present specification, utilizing less than 0.1 weight parts does not result in the desired effect of the addition, and if the amount is greater than 7 weight parts, the rise of the liquidus temperature and increase of the solid-liquid coexisting region temperature width are excessive, such that the operating temperature is not maintained within the desired 120-150°C range.

In contrast with the claimed alloy containing 52-85% In and 15-48% Sn, JP '404 discloses an alloy containing 92-98.9% In and 1-3% Sn. Despite the Examiner's assertion that varying the ranges of In and Sn taught by JP '404 to arrive at the claimed ranges would be obvious to the skilled artisan and only a matter of discovering optimum or workable ranges, the difference between the amount of Sn claimed and that taught by JP '404 is dramatic and clearly significant. Namely, it would not be obvious that the amount of Sn in JP '404 (**1 to 3%**) could be increased dramatically to **15-48%** (with a concurrent dramatic decrease in the amount of In in the alloy) with the expectation of similar results.

In fact, JP '404 in paragraph [0018] teaches away from the presently claimed invention, namely:

> ...the alloy whose percentage content of Sn is high is not suitable for a wire member for a thermal fuse element, because it has a big difference between a liquid phase surface temperature and a solid phase surface temperature. The percentage content of Sn is set to be more than 1 weight % and less than 3 weight %.

JP '404 thus teaches away from including greater than 3% tin in the alloy, and one reading JP '404 would certainly not be motivated to utilize 15-48% as claimed which, as previously explained, is necessary for realizing Applicants' invention. In fact, utilization of the composition of JP '404 would result in a fuse element having an operating temperature limited to 140 to 150°C. Therefore, it would certainly not be expected based on JP '404, which teaches away from a tin percentage of more than 3%, that utilizing 15-48% would result in a fuse element in which the operating temperature can be set to a predetermined temperature in the wide range of 120 to 150°C, which has been achieved by Applicants.

Further, there would have been no motivation to change the content of Sn in the alloy of JP '404 as suggested by the Examiner, since JP '404 does not show any indication of a need or desire to broaden the operating temperature range of the alloy or how to do it, if desired.

Finally, since an alloy having the claimed In/Sn ratio is not taught or suggested by JP '404, it would also not be obvious to the skilled artisan to add the claimed amounts of Ag, Au, Cu, Ni, Pd, Pt, and/or Sb to such an alloy, a combination which is necessary to realize the thermal resistance stability to a heat cycle of the present invention.

For all of these reasons, no *prima facie* case of obviousness has been established by the Examiner based on JP '404, since all of the claimed elements are not taught or suggested, nor would the claimed invention have been obvious based on this reference. Furthermore, the

unexpected properties of Applicants' invention, including the thermal resistance stability to heat cycle and strength against drawing, combined with the desirable operating temperature range of 120 to 150 °C, would not have been expected based on JP '404. Accordingly, reconsideration and withdrawal of the § 103(a) rejection are respectfully requested.

Based on the preceding Remarks, it is respectfully submitted that all of the pending claims are patentably distinct from the prior art of record and in condition for allowance. A Notice of Allowance is respectfully requested.

Respectfully submitted,

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(Date)

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